2003 Distributed Energy Peer Review

Making the Business Case for Distributed Energy – An Economic Analysis

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Purposes

- Economic analysis that shows the business case and potential benefits
- Case study of a real utility feeder with well-documented assumptions
- Scenarios address business-as-usual, improved market conditions for DER, and advanced DER technologies

- Tell the "DER story"
- Address comments about DER "hype"
- Use to explain DOE programs and priorities
- Not a technology analysis

Analysis Team

Analysts

- Utility Perspective
  - Distributed Utility Associates
- Customer Perspective
  - Gas Technology Institute
- Coordination&Integration
  - Energetics, Inc.

Technical Advisors

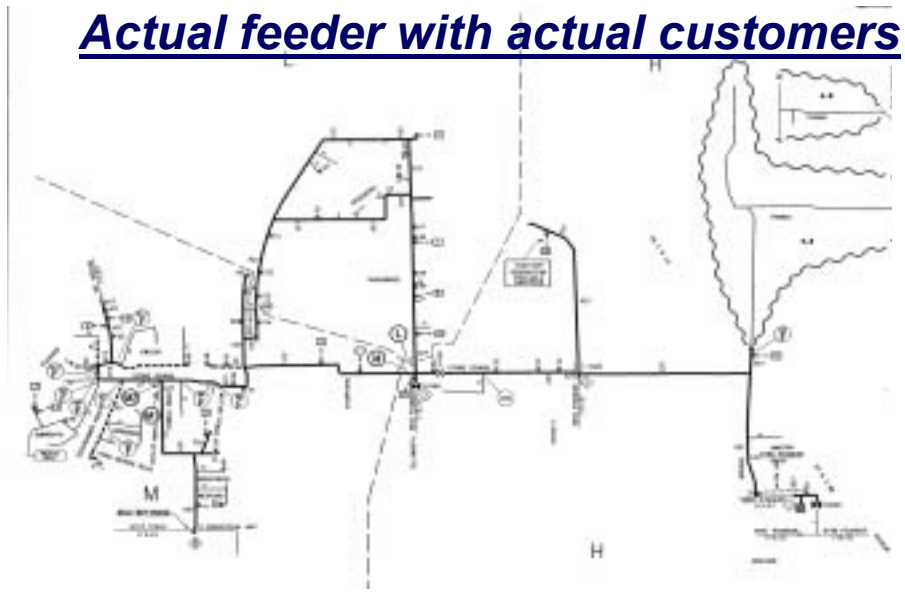
- American Electric Power
- DTE Technology
- EEA, Inc.

Analysis Location

- 1/3 commercial; 2/3 light industrial
- 16 MW rating 12 MW coincident peak load
- Load growth
  - 4%/yr 2002-2006
  - 3%/yr 2007-2011
  - 2%/yr 2012-2015
- Upgrade factor 50%
- No installed DER

Detroit Edison - Ann Arbor Michigan

Actual feeder with actual customers

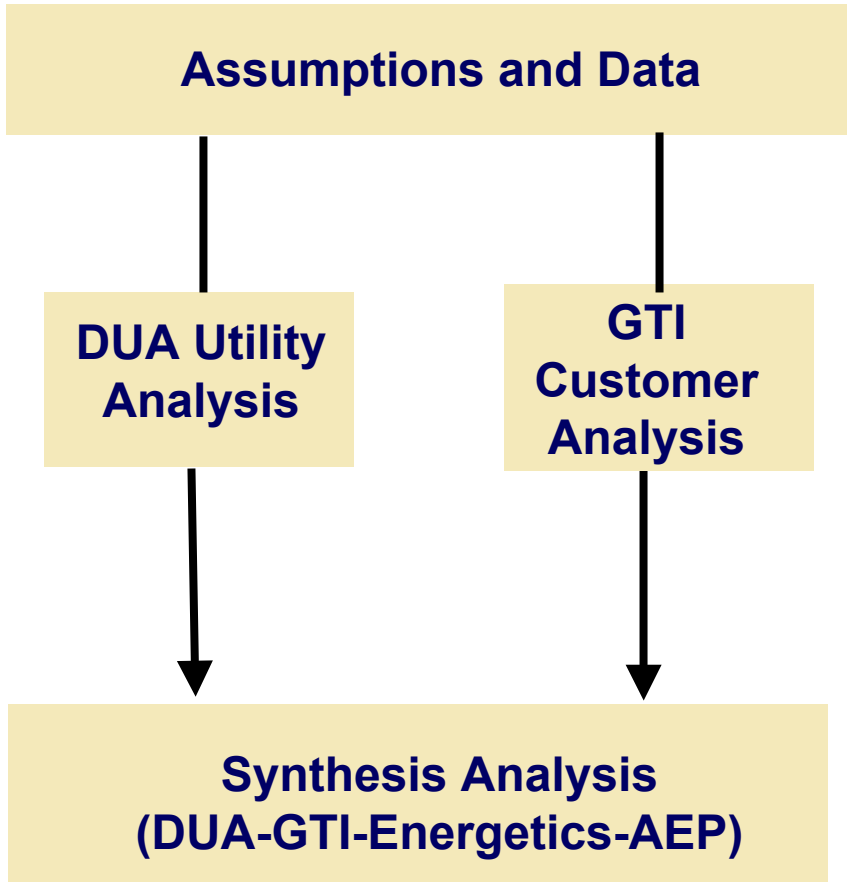


Pioneer Substation and Circuit 9796

Detroit Edison – Key Characteristics

- Supply Mix: 15+GW coal; 1GW nuclear; 1GW pumped storage
- 2.3 cents/kWh on-peak; 2.0 cents/kWh off-peak
- $13.08/kW/month demand charge
- $403/kW for T&D upgrades

Economic Analysis Flowchart



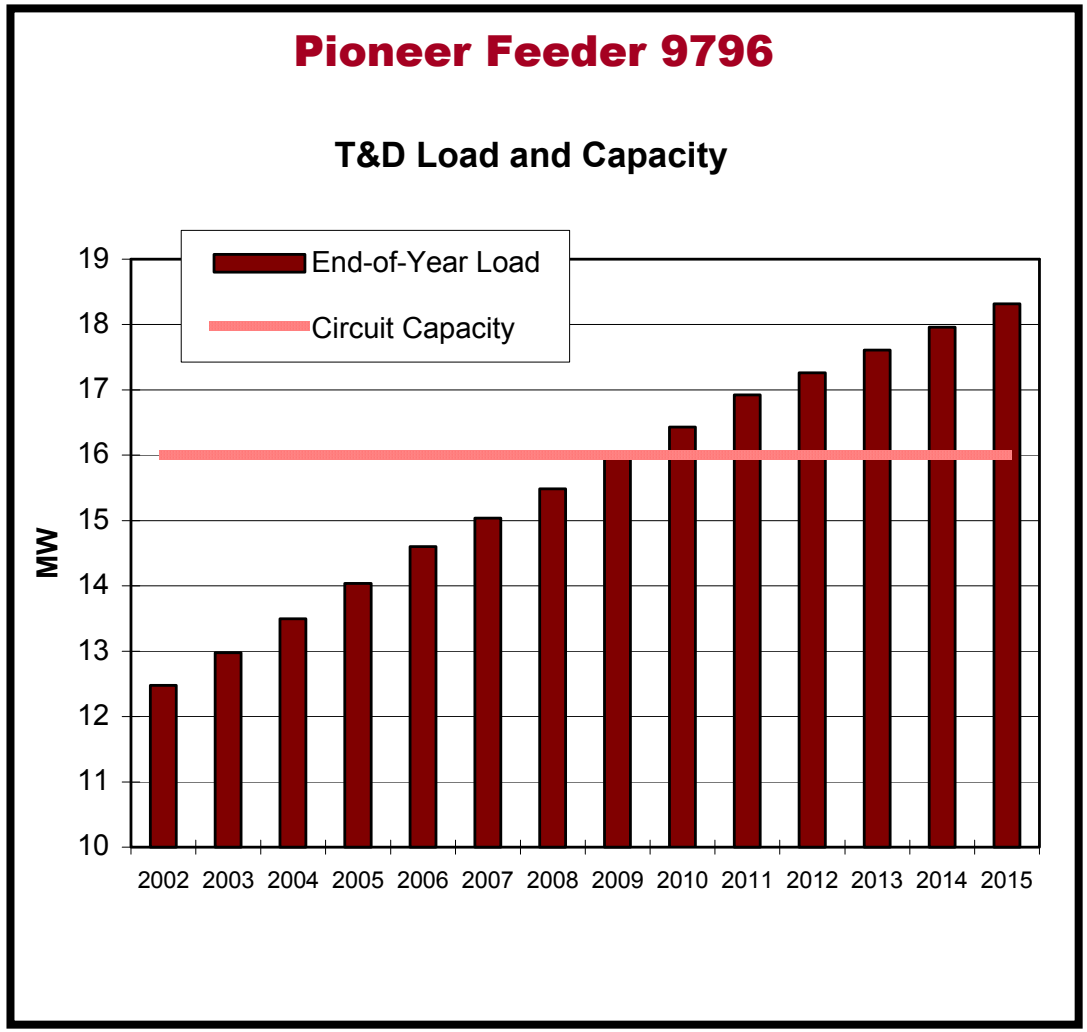
Scenarios and Assumptions

Business as Usual	▪ Today's interconnection, siting, and permitting issues ▪ Today's electricity pricing policies ▪ Today's distributed energy technologies
Improved Business Rules	▪ Utility DER is accepted practice ▪ Uniform interconnection standards ▪ Streamlined siting and permitting ▪ Locational demand charges ▪ Today's distributed energy technologies
Improved Business Rules and Advanced Technologies	▪ Improved business rules, plus ▪ Distributed energy technologies achieve cost, reliability, efficiency, emissions goals

Utility – Business as Usual

Key Points

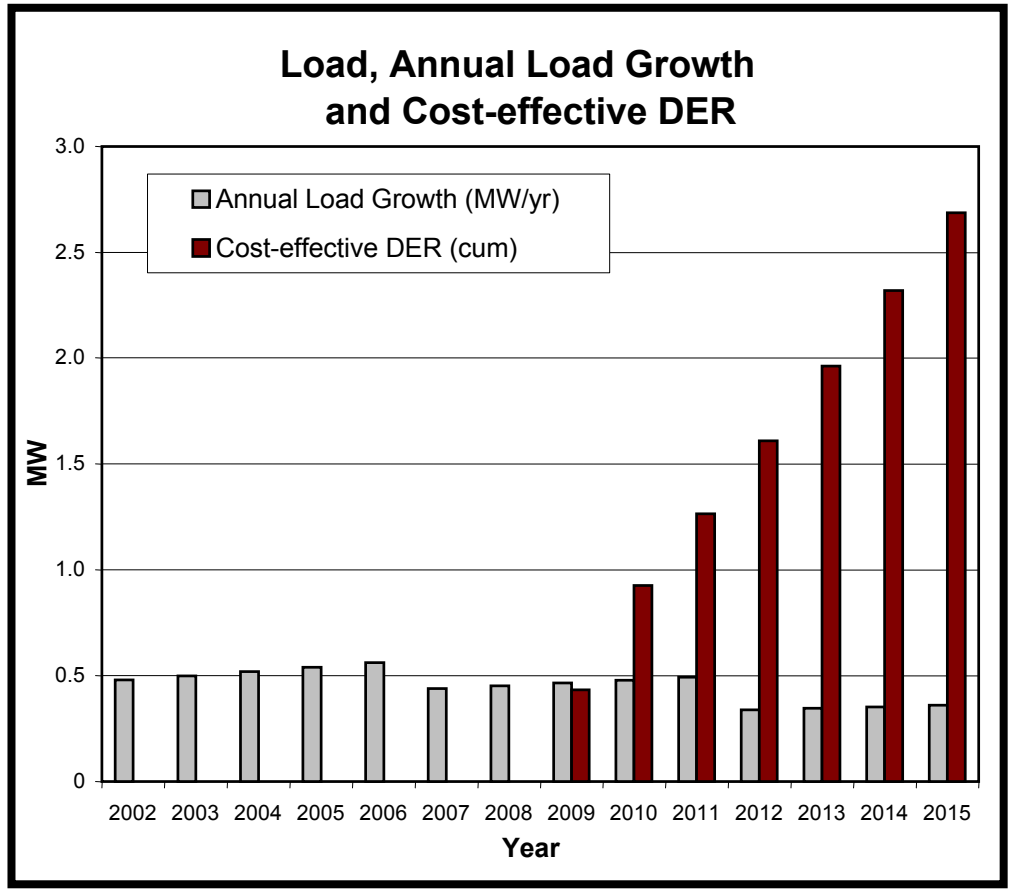
- Without regulatory permission utilities will opt for familiar lumpy T&D investments.
- DER not yet accepted common utility practice.
- Traditional T&D costing hurts prospects for DER.



Utility – Improved Business Rules

Key Points

- DER economic for all load exceeding T&D capacity upon convergence of
  - regulatory permission
  - technical familiarity
  - utility practices
  - risk and reward sharing
- DER can defer large T&D lump investments.

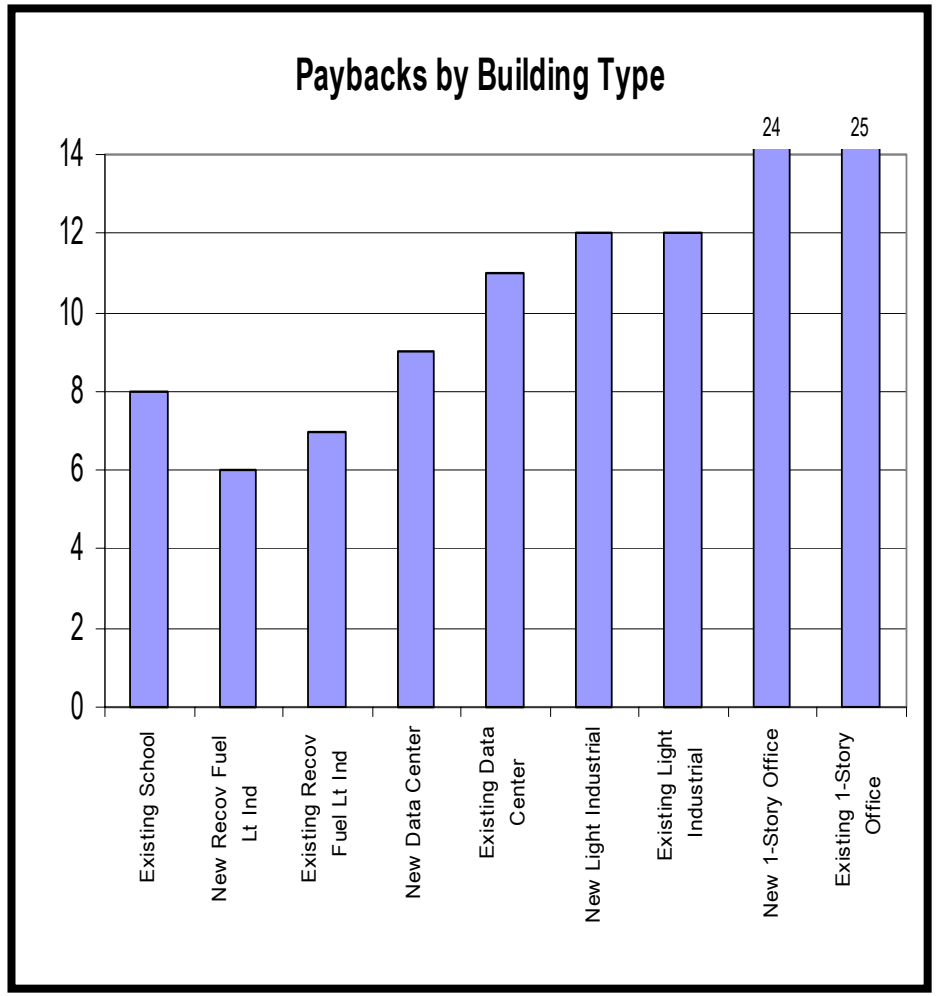


- T&D upgrade deferred 7 years
- Cost-effective DER Capacity = 2.7 MW
- 2.7 MW = 15% of circuit load
- Total (net) savings = $1 million

Customer – Business as Usual

Key Points

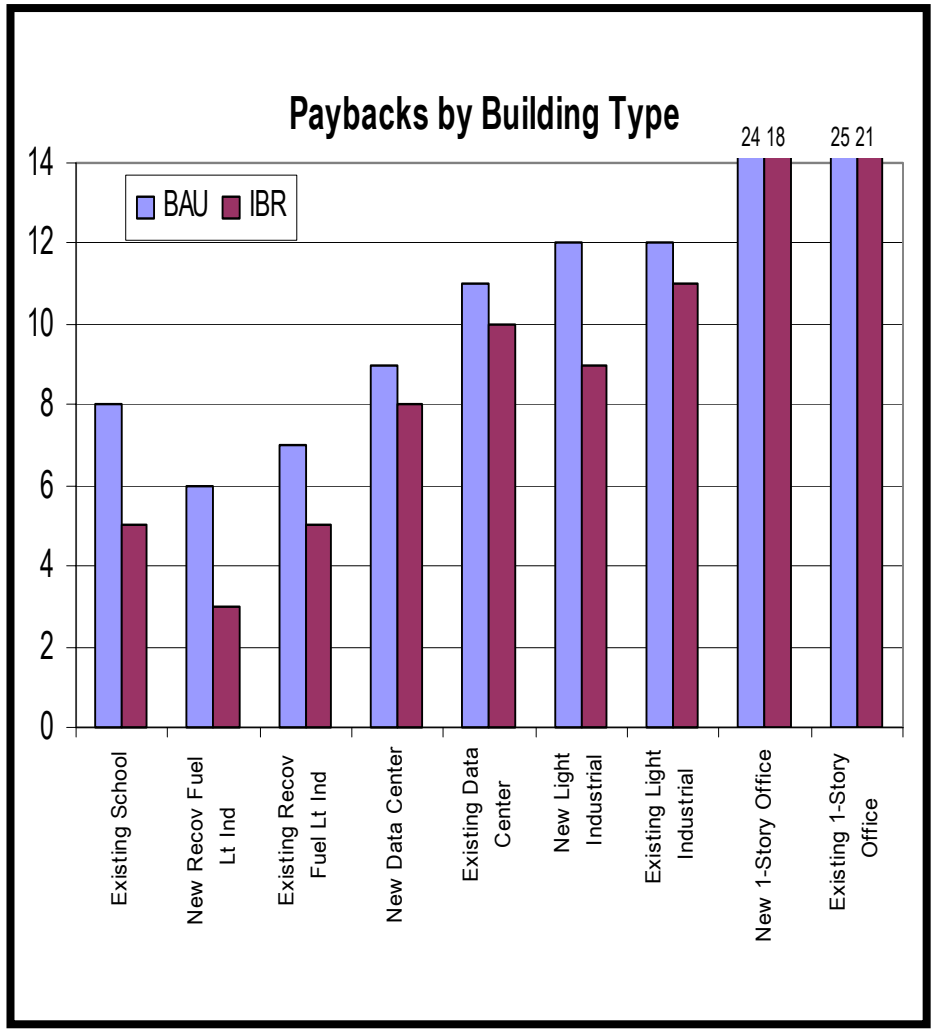
- DTE energy costs less than DER operating costs
- Installation cost is key variable
- Rate structure limits to 2000 hours of operation per year
- DER economics (CHP)
  - 2 schools with 8 year payback
  - Large industrials with recoverable fuel opportunities (but none on feeder)



Customer – Improved Business Rules

Key Points

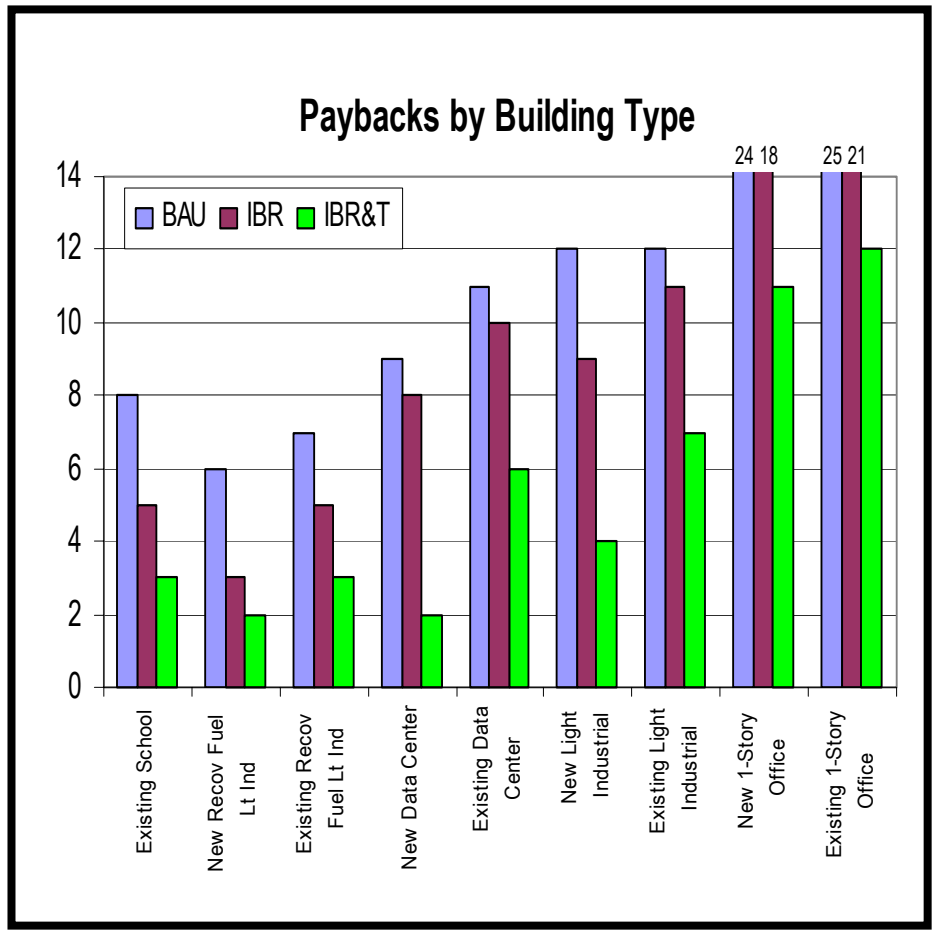
- Shorter paybacks across the board
- Improved business rules streamline engineering and interconnection and lower installation costs
- Reliability & security could motivate customers to use DER for non-economic reasons
- DER economics
  - Existing schools
  - Existing and new light industrials with recoverable energy
  - Large industrials and new hospitals (but none on feeder)



Customer – Improved Rules and Technologies

Key Points

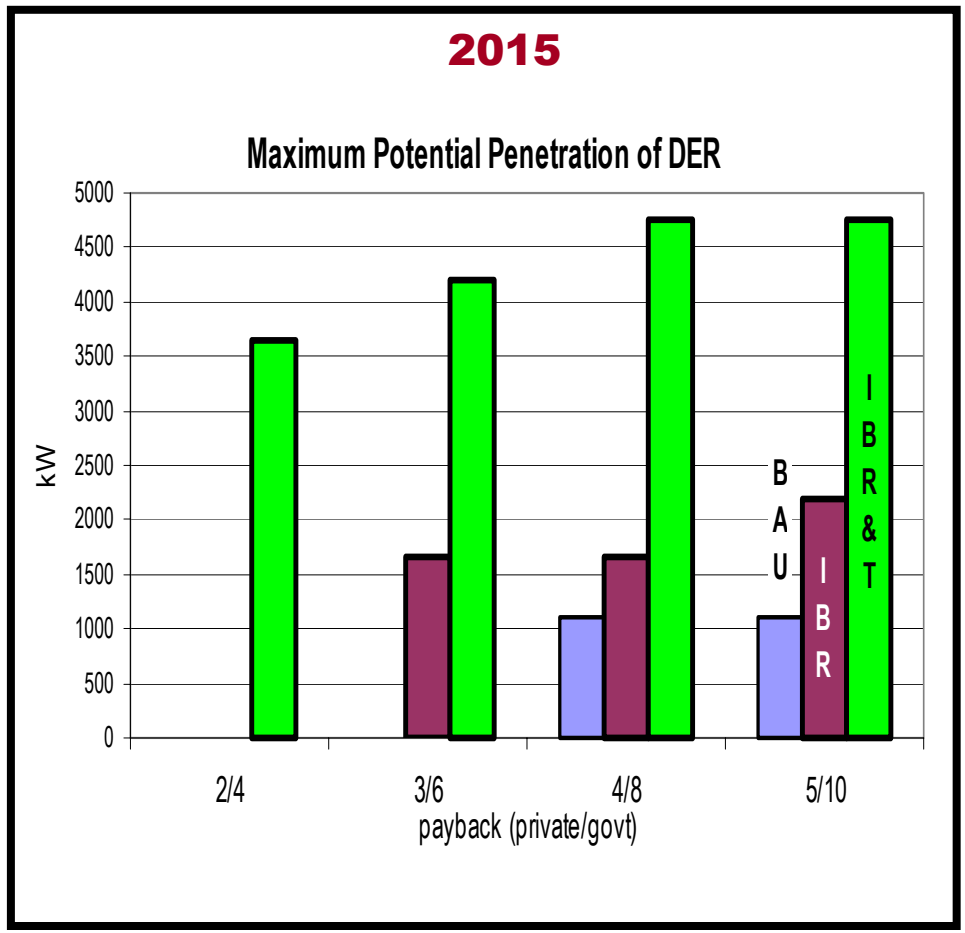
- Technology advancements improve efficiency and reliability and lower installed costs further
- Favorable DER economics
  - Existing schools and new and existing light industrials with recoverable fuels
  - New light industrial and new data center
  - New hospitals, large industrials with recoverable fuels, new high rise office building (but none on feeder)



Customer DER Economics

Key Points

- Installations vary by economic payback threshold
- Improvements to technologies and business rules substantially improve customer-side economics
- Business as usual varies from zero to 1.1 MW
- Improved business rules varies from zero to 2.2 MW
- Improved rules and advanced technologies varies from zero to 4.6 MW

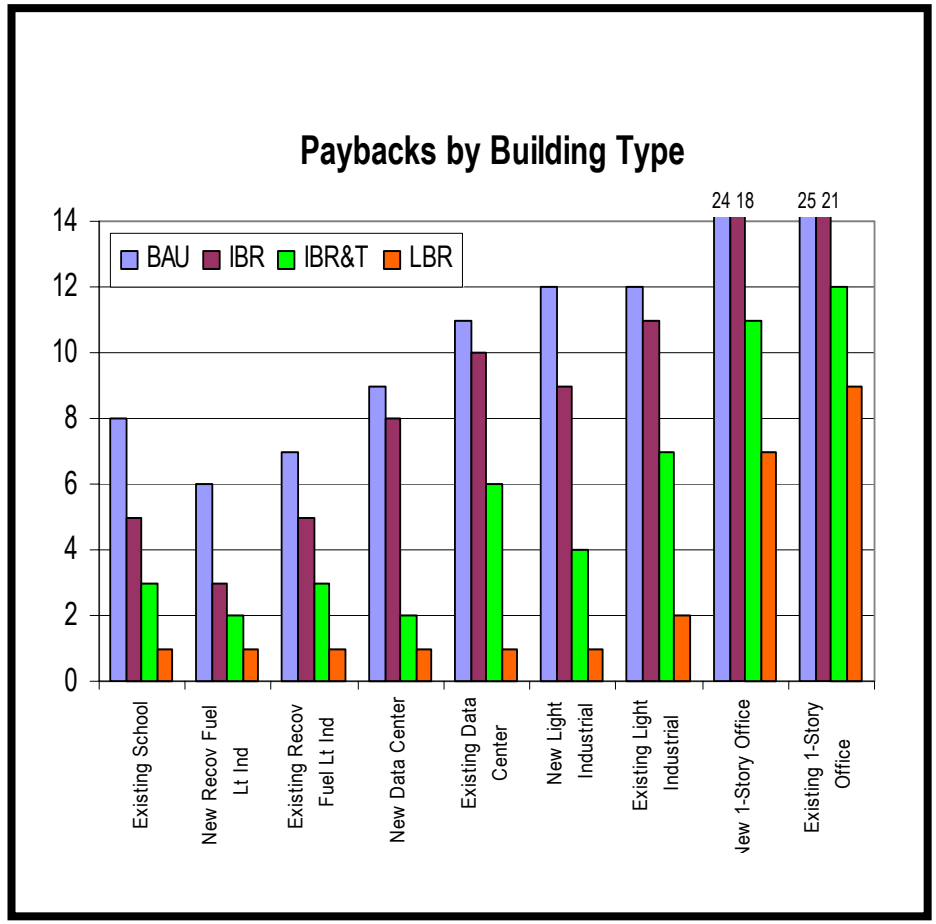


Impact of Rate Design

Key Points

- Significant decreases in customer payback periods
- Utility can use pricing to induce customer DER installations
- Rate design
  - Only when and where needed
  - Revenue neutral to the utility
  - Demand charge spread over 200 hour critical peak period
  - 78¢/kWh (during 200 hours)
- DER energy efficiency opportunities reduced

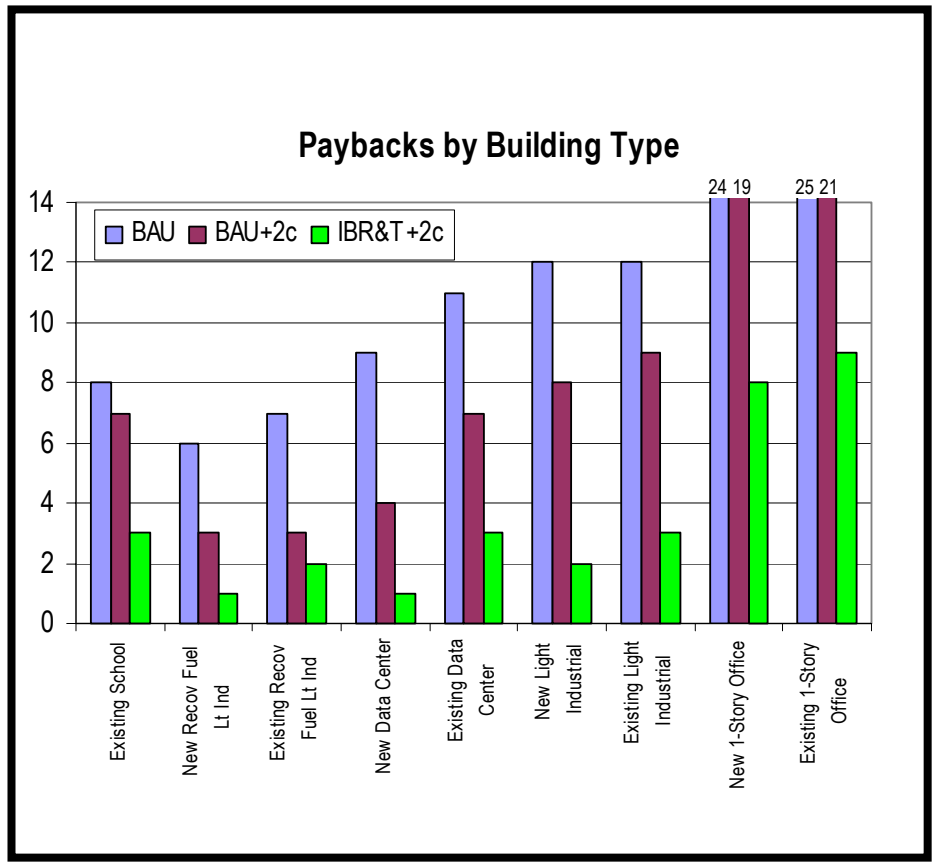
"Locational" Demand Charge



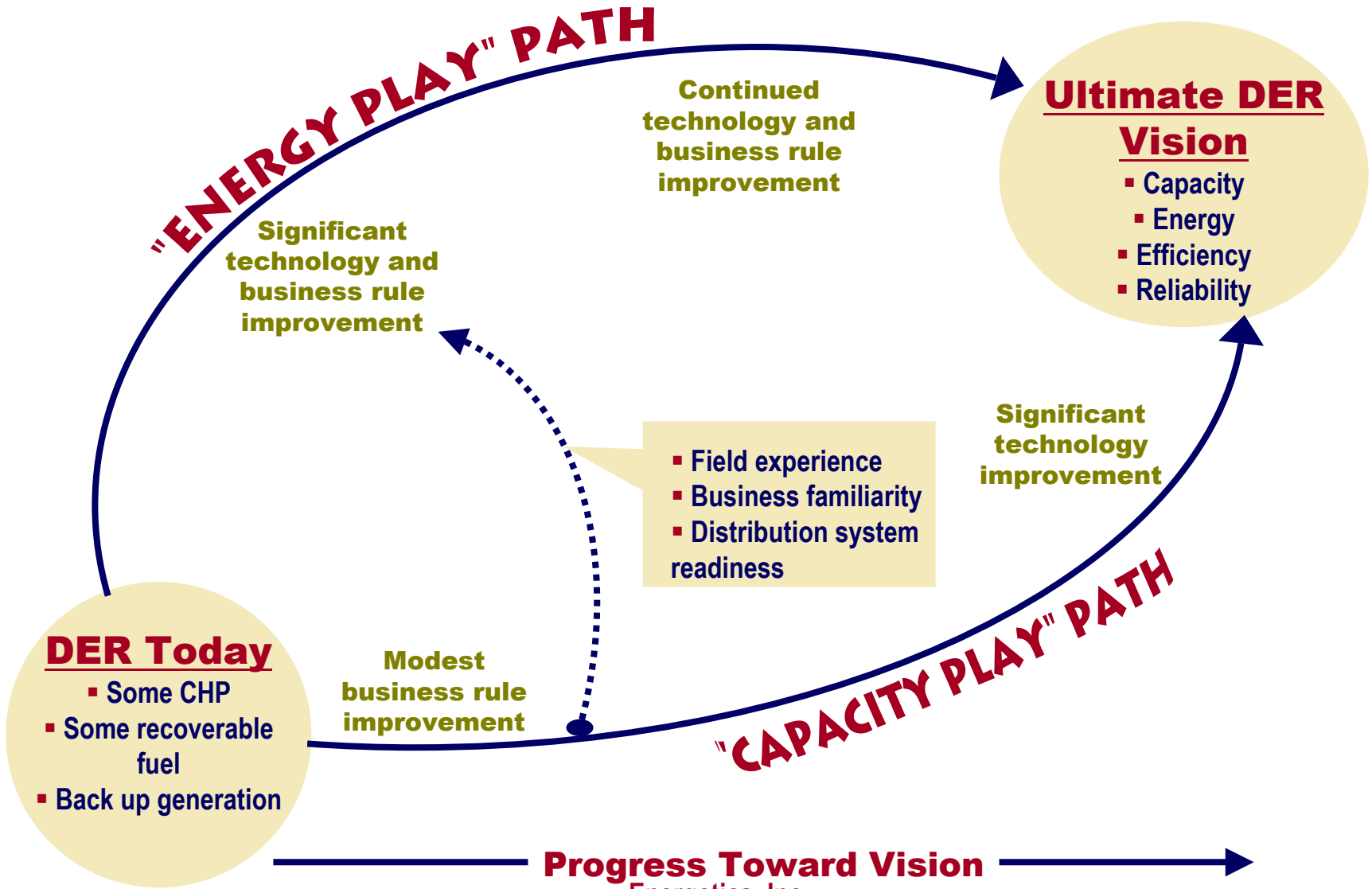
Impact of Higher Energy Charges

Key Points

- 4 cents per kWh for extrapolation to other areas
- Favorable economics for more customers, even without improved business rules or advanced technologies
- With advanced technologies, paybacks less than two years for several customers



Two Paths – One Goal



"Capacity Play"

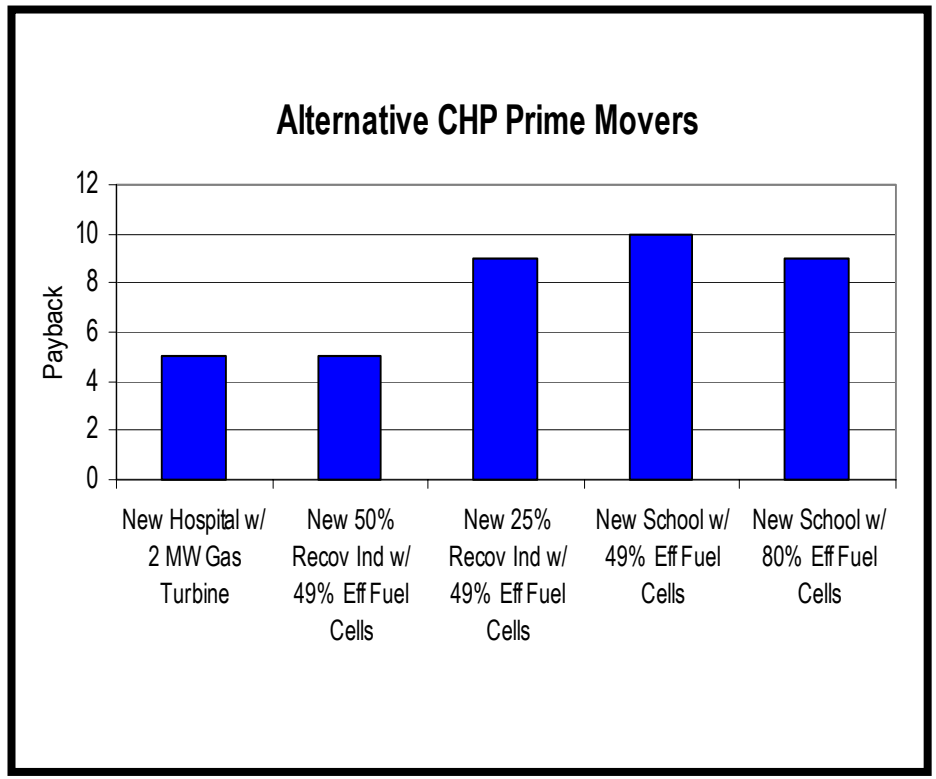
- Utility works out the technical details and proof of operation first
- Encourage "all comers" to bid to supply T&D capacity as needed
- Need to upgrade distribution system for expanded distributed energy installations
- Ready customer-side of the market for future DER technology improvements

"Energy Play"

Key Points

- Energy efficiency benefit not attained through capacity play
- Efficiency gains realized through combination of business rules and technology improvements
- Rate design can encourage efficiency and customer-side solutions
- Distribution system upgrades needed to support expanded customer installations

Improved Business Rules and Advanced Technologies Case



Conclusions

For circuit 9796, Pioneer Substation…

Utility Business Case

- Triggered by improved business rules
- Can be done with today's technologies
- Requires DER to be accepted utility business practice
- Requires regulatory acceptance of utility DER ownership

Customer Business Case

- Flourishes when advanced technologies available
- Requires lower capital costs and higher efficiencies
- Requires streamlined siting and permitting to lower installation costs

Joint Business Case

- Nearer-term "capacity play" using innovative pricing
- Longer-term "energy play" requires advanced technologies and DER friendly regulatory framework